

a substantially pure heparinase comprising a modified heparinase II having a modified product profile, wherein the modified product profile of the modified heparinase II is at least 10% different than a native product profile of a native heparinase II,

a substantially pure heparinase comprising a modified heparinase II that can cleave a glycosaminoglycan substrate having a modified heparinase II  $k_{cat}$  value, wherein the modified heparinase II  $k_{cat}$  value is at least 10% different than a native heparinase II  $k_{cat}$  value, and

a substantially pure heparinase comprising a modified heparinase I wherein the modified heparinase I has enzymatic activity that is not dependent on the presence of calcium,

wherein the modified heparinase II contains at least one amino acid residue that has been substituted with a different amino acid than in native heparinase II and wherein the residue that has been substituted is selected from the group consisting of (a) a cysteine residue corresponding to position 348 of SEQ ID NO: 2; (b) a histidine residue corresponding to at least one of positions 238, 252, 347, 440, 451, and 579 of SEQ ID NO: 2; and (c) a heparin-binding sequence residue corresponding to at least one of positions 446-451 of SEQ ID NO: 2,

and wherein the modified heparinase I contains at least one amino acid residue that has been substituted with a different amino acid than in native heparinase I and wherein the residue that has been substituted is a serine residue corresponding to position 377 of SEQ ID NO: 4.

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46. (Twice Amended) A method of specifically cleaving a heparan sulfate-like glycosaminoglycan:

comprising contacting a heparan sulfate containing fluid with the heparinase of any one of:

a substantially pure heparinase comprising a modified heparinase II having a modified product profile, wherein the modified product profile of the modified heparinase II is at least 10% different than a native product profile of a native heparinase II and

a substantially pure heparinase comprising a modified heparinase II that can cleave a glycosaminoglycan substrate having a modified heparinase II  $k_{cat}$  value, wherein the modified heparinase II  $k_{cat}$  value is at least 10% different than a native heparinase II  $k_{cat}$  value,

wherein the modified heparinase II contains at least one amino acid residue that has been substituted with a different amino acid than in native heparinase II and wherein the residue that has been substituted is selected from the group consisting of (a) a cysteine residue